International Journal for Pharmaceutical Research Scholars (IJPRS)

V-4, I-1, 2015 ISSN No: 2277 - 7873

RESEARCH ARTICLE

# Lipid Profile in Chronic Renal Failure Patients - Pre and Post Hemodialysis

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Manuscript No: IJPRS/V4/I1/00456, Received On: 07/03/2015, Accepted On: 15/03/2015

## ABSTRACT

The Chronic Kidney Disease is characterized by specific metabolic abnormalities of plasma lipids both qualitatively and quantitatively. Most common lipid abnormalities encountered are increased serum triglycerides and decreased serum HDL cholesterol with small alteration of other lipoprotein fraction in serum and in dialysis patients there is more of a dyslipidemia rather than hyperlipidemia. This may be a significant risk factor for vascular complications leading to increased morbidity and mortality in CKD patients. So Aim of study was to assess cardiovascular risk in chronic renal failure (CRF) patients by studying pre and post hemodialysis Serum Total Cholesterol, HDL-Cholesterol, LDL-Cholesterol, Triglyceride levels in CRF patients. Total Cholesterol, Triglyceride, LDL-C showed highly significant decreased in mean concentration in post-hemodialysis than in pre- hemodialysis samples of CRF patients. HDL-C showed significant elevation in post-hemodialysis than in pre- hemodialysis samples of CRF patients. Thus this study demonstrates that there is a decreased risk of cardiovascular complications in patients undergoing hemodialysis and decreased risk of cardiovascular improves the general wellbeing and lower the cost of health care in hemodialysis patients.

## KEYWORDS

Chronic renal failure (CRF), Chronic Kidney Disease (CKD), HDL-Cholesterol (HDLC), LDL-Cholesterol (LDLC)

## INTRODUCTION

Chronic Renal Failure (CRF) is a devastating disease with clinical, economic and ethical dimensions and is emerging as a major public health problem globally.[1] In India the approximate prevalence of Chronic Kidney Disease (CKD) is 800 per million populations (pmp), and the incidence of end-stage renal disease (ESRD) is 150–200 pmp.[2]

The Chronic Kidney Disease is characterized by specific metabolic abnormalities of plasma lipids both qualitatively and quantitatively. Most common lipid abnormalities encountered are increased serum triglycerides and decreased serum HDL cholesterol with small alteration of other lipoprotein fraction in serum and in dialysis patients there is more of a dyslipidemia rather than hyperlipidemia. This may be a significant risk factor for vascular complications leading to increased morbidity and mortality in CKD patients.[3]

Patient with CKD are at risk for an increased cardiovascular disease and have higher prevalence of hyperlipidemia (dyslipidemia) than the general population.[4]

With wide spread availability of dialysis the lives of hundreds of thousands of patients with ESRD have been prolonged. Although there are geographic variations hemodialysis remains the most common therapeutic modality for ESRD.[5]

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## MATERIAL AND METHODS

The study was carried out at Dr. D. Y. Patil Medical College, Hospital and research centre Pimpri, Pune-18. The study population was derived from in and around Pimpri, Pune area

### Study Design

The study was designed as a community based cross sectional analytical study

### Ethical Clearance

The proposal of the study was put forth in the meeting of ethical committee of the institute and necessary permission and clearance was obtained

### Study Population

Total 100 subjects participated in this study

50 patients with chronic renal failure (CRF) and

50 healthy controls matching in age and sex were considered.

### Inclusion Criteria

1. Patient with chronic renal failure (CRF) who is on haemodialysis for more than one month.

2. An equal number of age and sex matched healthy controls.

### Exclusion Criteria

The following patients were excluded from the study. Patients with 1. Liver disease, 2. Diabetes mellitus, 3. Infectious disease, 4. Malignancy.

### Collection of Blood Samples

8-10 ml of fasting blood samples was collected before and after hemodialysis in a plain bulb taking all aseptic precautions. Serum was used after centrifugation.

### Parameters

***Lipid Profile***

1. Serum total Cholesterol-Dynamic extended stability CHOD-PAP Method (With LCF), End Point by Roeshlaus
2. Serum HDL-Cholesterol-Liquid stable reagent by Trinder reaction.
3. Serum LDL- Chholesterol- Liquid stable reagent by Trinder reaction.
4. Serum Triglyceride-Dynamic extended stability with lipid clearing agent GPO-Trinder Method End Point by Wako and the modification by M.Gowan et al and Fossati et al. All tests was done in CCL using semiautomatic/automatic analyser.

## RESULTS

Table 1: Comparison of Total Cholesterol between Control, Pre-Hemodialysis, Post-Hemodialysis

| TOTAL CHOLESTEROL | | | |
|---|---|---|---|
| **Category / Parameter** | **Control** | **Pre-Hemodialysis** | **Post-Hemodialysis** |
| **Arithmetic Mean** | 164.18 | 178.98 | 167.18 |
| **Standard Deviation** | 26.30 | 26.21 | 20.03 |
| **Inference** | Control Vs Pre-Hemodialysis<br><br>P=0.0001<br>Hs | Pre-Hemodialysis Vs Post-Hemodialysis<br><br>P=0.004<br>Hs | Control Vs Post-Hemoialysis<br><br>P=0.022<br>S |

Table 2: Comparison of Triglyceride between Control, Pre-Hemodialysis Post-Hemodialysis

| TRIGLYCERIDE | | | |
|---|---|---|---|
| **Category / Parameter** | **Control** | **Pre-Hemodialysis** | **Post-Hemotdialysis** |
| **Arithmetic Mean** | 87.04 | 105.04 | 92.08 |
| **Standard Deviation** | 24.81 | 24.76 | 23.58 |
| **Inference** | Control Vs Pre-Hemodialysis P=0.0001 Hs | Pre-Hemodialysis Vs Post-Hemodialysis P=0.001 Hs | Control Vs Post-Hemodialysis P=0.03 S |

Table 3: Comparison of High Density Lipoprotein between Control, Pre-Hemodialysis Post-Hemodialysis

| HIGH DENSITY LIPOPROTEIN | | | |
|---|---|---|---|
| **Category / Parameter** | **Control** | **Pre-Hemodialysis** | **Post-Hemodialysis** |
| **Arithmetic Mean** | 50.76 | 44.54 | 57.52 |
| **Standard Deviation** | 5.91 | 7.36 | 10.98 |
| **Inference** | Control Vs Pre-Hemodialysis P=0.001 Hs | Pre-Hemodialysis Vs Post-Hemodialysis P=0.001 Hs | Control Vs Post-Hemodialysis P=0.001 Hs |

Table 4: Comparison of Low Density Lipoprotein between Control, Pre-Hemodialysis Post-Hemodialysis

| LOW DENSITY LIPOPROTEIN | | | |
|---|---|---|---|
| **Category / Parameter** | **Control** | **Pre-Hemodialysis** | **Post-Hemodialysis** |
| **Arithmetic Mean** | 92.44 | 127.44 | 119.84 |
| **Standard Deviation** | 18.51 | 27.94 | 20.09 |
| **Inference** | Control Vs Pre-Hemodialysis P=0.001 Hs | Pre-Hemodialysis Vs Post-Hemodialysis P=0.048 S | Control Vs Post-Hemodialysis P=0.001 Hs |

## DISCUSSION

### Total Cholesterol

Cholesterol is widely distributed in all cells of the body, but particularly in nervous tissue. It is a major constituent of the plasma membrane and of plasma lipoprotein. It is found as cholesteryl ester and transported in lipoproteins of the plasma.[6] In this study the mean concentrations of TC in controls and in patients with CRF during pre and post- hemodialysis sessions were 164.18 mg/dl, 178.18mg/dl and 167.18 mg/dl, respectively.

The mean levels of Total cholesterol was increased in pre-hemodialysis when compared with controls and was found to be statistically highly significant (p= 0.0001) and the mean levels of total cholesterol was decreased in post-hemodialysis when compared with pre-hemodialysis and was found to be statistically highly significant (p= 0.0004) This is in accordance with the studies of Nitin S. Ngane and Ganu JV.[7] In this study they found that post hemodialysis sample mean value of Total Cholesterol fall significantly compared to pre hemodialytic sample. Tsitamidou.R, et al.[8] states that HD patients had higher levels TC than controls. Maheshwari.N, et al.[9] shows that the serum cholesterol was not significantly different in MHD patients and control group Raju DSSK, et al.[3] shows that there was no hypercholesterolemia hemodialysis groups when compared with controls. And Simona Baldi, et al.[10] study state that after a single hemodialysis, total cholesterol showed modest (~15%) but statistically significant increments.

Serum cholesterol is positively correlated with the incidence of atherosclerosis and coronary vascular disease[6]. During dialysis the flux biocompatible membrane may be responsible to remove cholesterol in post-hemodialysis samples. The post-hemodilalytic TC levels are still high as compared to that of controls. Few factors are responsible to elevate the mean level of serum TC. Among them up regulation of hepatic enzymes Hydroxy-3-methylglutaryl-CoA reductase and cholesterol 7α –hydroxylase are important.[7]

### Trigycerides

In this study the mean concentrations of TG in controls and in patients with CRF during pre- and post- hemodialysis sessions were 87.04 mg/dl, 105.04 mg/dl and 92.08 mg/dl, respectively.

The mean levels of triglyceride was increased in pre-hemodialysis when compared with controls and was found to be statistically highly significant (p= 0.0001).the mean levels of triglyceride was decreased in post- hemodialysis when compared with pre-hemodialysis and was found to be statistically highly significant (p= 0.001) .This is in accordance with the studies of Nitin S. Ngane and Ganu JV.[7] In this study they found that post hemodialysis sample mean value of TG fall significantly compared to pre hemodialytic sample. Tsitamidou. R, et al.[8] shows that HD patients had higher levels of TG than controls. Maheshwari. N, et al.[9] shows that Serum TG was significantly increased in MHD patients than in the control group. Raju DSSK, et al.[3] shows that statistically significant increase of serum triglycerides in hemodialysis groups when compared with the controls and Simona Baldi, et al.[10] study state that after a single hemodialysis Triglyceride was reduced by 20% post-dialysis.

Plasma TG start to increase in early stages of CKD and show the highest concentration in nephrotic syndrome and in dialysis patients especially those who are treated with peritoneal dialysis

The predominant mechanism responsible for increased concentration of TG rich lipoprotein in predialysis patients is one of delayed catabolism. The reduced catabolic rate is likely due to diminished lipoprotein lipase activity as a consequence of down regulation of the enzyme gene and the presence of lipase inhibitors

In hemodialysis patients the repeated use of low molecular heparins for anticoagulation may lead to a defective catabolism of TG -rich lipoproteins as heparin releases LPL from endothelial surface and thus its chronic use may result in LPL depletion. The use of flux polysulfone membrane or cellulose triacetate membrane is accompanied by a significant reduction in serum TG.[11]

**High Density lipoprotein (HDL)**

In this study the mean concentrations of HDL-C in controls and in patients with CRF during pre- and post- hemodialysis sessions were 50.76 mg/dl, 44.54mg/dl and 57.52 mg/dl, respectively.

The mean levels of high density lipoprotein was decreased in pre-hemodialysis when compared with controls and was found to be statistically highly significant (p= 0.001) the mean levels of High density lipoprotein was increased in post-hemodialysis when compared with pre-hemodialysis and were statistically highly significant (p= 0.001).

The results are in accordance with the studies of Nitin S. Ngane and Ganu JV.[7] In this study they found that post hemodialysis sample mean value of Mean value of Serum HDL-C were significantly increased in post hemodialytic sample as compared to pre hemodialytic sample. Maheshwari. N, et al.[9] shows that HDL-C was significantly lower in MHD patients than in the control group. Raju DSSK, et al.[3] shows that statistically significant decrease in serum HDL-C in hemodialysis groups when compared with the controls. And Simona Baldi, et al.[10] study states that After a single hemodialysis HDL-cholesterol concentrations showed modest (~15%) but statistically significant increments.

CRF is consistently associated with reduced plasma HDL-C concentration. It is primarily due to CRF induced dysregulation of several important proteins like,

a) Lecithin-Cholesterol Acyl Transferase (LCAT):

b) Cholesteryl Ester Transfer Protein (CETP):

c) Hepatic lipase

d) Scavenger Receptor B-1 (SR-B1):

e) Acyl-CoA Cholesterol Acyl Transferase (ACAT):[12]

Hemodialysis procedure may also have a contributory role in the reduced HDL-C levels of dialysis patients. Thus, in dialysis patients the type of membrane and dialysate used in hemodialysis procedure may influence the HDL-C levels. It has been shown that the use of high-flux instead of low flux membrane is associated with an increase in apolipoprotein AI and HDL-C values. [11]

**Low Density Lipoprotein (LDL-C)**

In this study the mean concentration of LDL-C in controls was 92.44 mg/dl. and during pre- and post- hemodialysis sessions were 127.44 mg/dl and 119.84 mg/dl respectively.

The mean levels of low density lipoprotein was increased in pre-hemodialysis when compared with controls and was found to be statistically highly significant (p= 0.001) The mean levels of low density lipoprotein was decreased in post-hemodialysis when compared with pre-hemodialysis and was found to be statistically significant (p= 0.0048)

The results are in accordance with the studies of Nitin S. Ngane and Ganu JV.[7] In this study they found that post hemodialysis sample mean value of LDL-C fall significantly compared to pre hemodialytic sample. Tsitamidou. R, et al.[8] shows that HD patients had higher levels of LDL-C than controls. Maheshwari. N, et al.[9] shows that LDL-C levels were not significantly different in MHD patients than in the control group. Raju DSSK, et al.[3] shows that serum LDL-C was not significantly altered in hemodialysis groups when compared with controls. And Simona Baldi, et al.[10] study states that after a single hemodialysis LDL concentrations showed modest (~15%) but statistically significant increments.

There are qualitative changes in LDL-C in patients with CKD and dialysis patients. The proportions of small density LDL (sdLDL) and IDL, which are considered to be highly atherogenic are increased. Increased sdLDL is a subtype of LDL that has high propensity to penetrate the vessel wall, become oxidized and triggers the atherosclerotic process. IDL is an intermediate metabolite of VLDL that is normally further degraded to LDL with the cleavage of triglycerides by lipase

Because of decreased hepatic triglyceride lipase activities in hemodialysis patients, the conversion

 

of IDL to LDL is impaired and IDL accumulates in plasma.

IDL and sdLDL have high affinity for macrophages, which theoretically promote their entry into the vascular wall to participate in the formation of foam cells and atherosclerotic plaque. The plasma levels of apo B, which is the major apolipoprotein of LDL and IDL, are strongly correlated with levels of theselipoproteins.[13]

## CONCLUSION

This study demonstrates that there is a decreased risk of cardiovascular complications in patients undergoing hemodialysis. These effects can be increased by advising proper diet or by using lipid lowering drugs. Thus decreased risk of cardiovascular improves the general wellbeing and lower the cost of health care in hemodialysis patients. This improved quality and extended duration of life, by hemodialysis treatment, is related to the lowering of risk factors for cardiovascular disease in CRF patients[5].

Thus maintenance hemodialysis is the support of treatment for the patients with CRF who are waiting for, or who are not suitable to undergo renal transplantation. Adequate dialysis treatment has prolonged the survival of patients with improved quality of life.

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